by bornite, which has perhaps not received the attention from mineralogists it deserves. Are we certain that the absence of inclusions of such size as to be visible under the microscope (in this case, the metallographic microscope) necessitates the hypothesis of the existence of solid solution at all? In metallographic study inclusions may be seen to vary more or less continuously from microscopically visible sizes down to the limit of microscopic visibility, which lies in the general neighborhood of 0.001 mm. in diameter. This lower limit is determined by the wave-length of light, and has no significance as far as chemical molecules are concerned. It can therefore not be expected that the variation in the size of inclusions ceases at that particular point; in all probability they also occur of submicroscopic size. Accordingly, as an alternative hypothesis to that of Professor Rogers the writer would suggest that the variability in the composition of bornite (normally $Cu_5FeS_4$) is due to the presence of submicroscopic inclusions of one or more of the minerals often occurring as visible inclusions in it, namely chalcocite, chalcopyrite and pyrite.

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## WIND GAPS

ARE physiographers unconsciously predisposed in favor of an explanation of topographic phenomena which possesses a dramatic element as against one which, though quite obvious, involves only the operation of causes which are commonplace?

An examination of the explanation given of the formation of wind gaps by writers of American text-books on physical geography and geology would seem to answer this question in the affirmative.

All who treat this topic, so far as I have been able to determine, explain wind gaps—all of them—as deserted water gaps—vestigial structures, as it were, inherited from a certain stage in a past cycle of erosion.[1]

In this explanation all these writers hark back to the original source, the monograph by Bailey Willis on " The Northern Appalachians " (American Book Company, 1895). It is true that the monograph itself refers to earlier sources—to the work of Davis and Hayes and Campbell—but the constancy of reference by these text-book authors to Snickers Gap, cited in the monograph as a type illustration of a wind gap, and the reproduction of the two diagrammatic maps, there first printed as illustrations accompanying the explanation of same, indicate this monograph of Bailey Willis as the true source.

It is not the purpose of this article to detract from the general admirable treatment of mountain structure contained in the above treatise. It is one of the American physiographic classics, replete with that wealth of imagery derived from human activity which so characterizes a writer on physiography of the school of Davis. In that monograph streams now " leap " and now " loiter "; they " ripple over gravel bars " or " linger between alluvial banks "; they commit " piracy " and " conquer their neighbors."

It does seem to the writer, however, that a danger to scientific accuracy lurks in this imagery. An explanation that applies in the vast majority of instances is lost sight of because prosaic.

As a substitute, therefore, for the—beheading—diverting—reversing—stream processes, which must concur in the formation of every wind gap, it would seem, in the view of the writers of the above school of physiography, I would suggest the following:

A wind gap in the vast majority of instances is simply a col in the top of the divide, notched by the retreat of the sources of two

[1] Salisbury and Atwood, "Interpretation of Topographic Maps," p. 51. Salisbury, Atwood, and Barrows, "Text-book on Physiography." Tarr and Martin, "College Physiography," p. 567. Tarr, "New Physiography," p. 104. Hobbs, "Earth Features and Their Meaning," pp. 176, 177. Dryer, "Lessons in Physical Geography," p. 160. Emmerson, "Manual of Physical Geography." Trafton, "Laboratory and Field Exercises in Physical Geography," p. 19. Scott, "An Introduction to Geology," p. 448. Chamberlin and Salisbury, "Geology." Part I., p. 139.

streams which have happened to head opposite each other.

It is one of the commonest phenomena in a maturely dissected region, whether this be mountainous or simply a plateau.

In the Blue Ridge Region covered by Harpers Ferry sheet, there is nothing in the arrangement of the drainage or in the disposition of the contours which would suggest that all of those wind gaps—Snickers, Ashby, Crampton, Turners and a number unnamed—might not be as satisfactorily explained in this way as by a "diversion"—reversion—and "beheading" process. To my mind, the simple notching process affords by far the better explanation, since it fits in with the general and notable characteristic of the topography which militates against the Willis theory. This is the total lack of that "barbing" arrangement in the tributaries of the streams alleged to have been reversed which would seem to be necessary as conclusive evidence that these wind gaps are corollaries resulting from cases of "river piracy."

There is one line of evidence, namely, a progressive deepening of the wind gap notches in the Blue Ridge from the Water Gap of the Potomac at Harpers Ferry southward, which, if this were pronounced enough, might be alleged in support of the "River Capture Theory." However, Professor Willis barely hints at this evidence in calling attention to Manassas Gap—the most remote from the Potomac water gap of the wind gaps in the Blue Ridge south of the Potomac as well as the deepest.

The paragraphs from the Willis monograph which have become the sources of "the accepted text-book theory of wind gap formation" are as follows:

On the Kittatinny Plain many smaller streams flowed across the ranges; and they also, persisting in their courses during the upheaval, cut water gaps in the hard beds. But they could not deepen the gaps as rapidly as did the great rivers, and the work of the smaller streams is now represented by the notches in the ridges high above the Shenandoah Plain. No streams now flow through these little V's: they are *wind gaps* from which a rivulet descends on each side of the ridge. . . . The Potomac traverses the Blue Ridge at Harpers Ferry. South of this water gap are several wind gaps, such as Snickers Gap, which mark the channels of ancient streams, now diverted. The Shenandoah River enters the Potomac above the water gap at Harpers Ferry, flowing northward along the western base of the Blue Ridge. The streams which passed through Snickers Gap and the other wind gaps ran above the present course of the Shenandoah, crossing it about at right angles. The two drainage systems could not exist at one time; therefore it is evident that the older one has been replaced by the younger river, the Shenandoah. This diversion took place by the gradual growth of the Shenandoah from its mouth southward. The Potomac, the large stream, cut its water gap faster than Snickers Gap was cut. The Young Shenandoah of the Kittatinny Plain, a small tributary of the Potomac where the mouth of the present Shenandoah is, acquired considerable fall as the Potomac deepened its gorge and sawed its channel down rapidly in the limestone, which offered no great resistance. But the stream in Snickers Gap, with perhaps less fall and not much greater volume than the Shenandoah, had to saw much harder rock in crossing the Blue Ridge. Its channel remained high, therefore, as compared with that of the Shenandoah. The latter, extending its headwaters backward as a tree puts out new twigs, eventually tapped the channel of the other stream above Snickers Gap. The waters above the point of attack joined the Shenandoah; the section between the point of attack and Snickers Gap was reversed as the Shenandoah rapidly deepened the channel of its new conquest; and the lower portion of the stream, now called Beaverdam Creek, having lost its original head waters, took its rise at Snickers Gap. Thus the ancient stream which once flowed through the gap was divided into three sections, the diverted, the inverted and the beheaded, while the Shenandoah, the diverter, was strengthened.

Thomas Jefferson, the only one of our presidents, except Roosevelt, who ever showed marked interest in science, also tried his hand at explaining topographic features of the Blue Ridge. It occurs in his notes on Virginia written in 1781, and the passage is as follows:

The passage of the Potomac through the Blue Ridge is perhaps one of the most stupendous scenes in nature. You stand on a very high point of land. On your right comes up the Shenandoah,

having ranged along the foot of the mountain an hundred miles to seek a vent. On your left approaches the Potomac, in quest of a passage also. In the moment of their juncture they rush together against the mountain, rend it asunder and pass off to the sea.

The first glance of the scene hurries our senses into the opinion that the earth has been created in time, that mountains were formed first, that the rivers began to flow afterwards, that in this place particularly they have been dammed by the Blue Ridge Mountains, and have formed an ocean which filled the whole valley, that continuing to rise they have at length broken over at this spot and have torn the mountains down from the summit to the base.

Probably in the whole realm of literature there does not exist a more striking illustration of the cataclysmic point of view in attempting to explain geological phenomena than is expressed in the above passage, and it serves to illustrate how far in general in the scientific realm we have got away from the catastrophic ideas of Jefferson's day, which antedate even somewhat those of Cuvier and Schlotheim; yet when one examines the literature of modern physiography and sees the readiness with which "an uplifted and dissected peneplain" is invoked to explain every even sky-line or approximate uniformity in heights of mountain summits, while every peculiarity in drainage is accounted for as an inheritance from a past cycle of erosion, overlooking in many cases a simpler explanation involving only "processes now in operation"; he wonders if there does not lurk therein somewhat of the old catastrophism.

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## SCIENTIFIC BOOKS

*Der Nachweiss organischer Verbindungen.* Augsgewählte Reaktionen und Verfahren. By DR. L. ROSENTHALER. Verlag von Ferdinand Enke, Stuttgart. 1914. $6 \times 9.5$ inches. Pp. xvii + 1,070. 35.20 Marks bound.

This work comprises the nineteenth and twentieth volumes of a series of monographs edited under the direction of Dr. B. M. Margosches, and published under the general title "Die Chemische Analyse. Sammlung von Einzeldarstellungen auf dem Gebiete der chemischen, technisch- chemischen, und physikalisch-chemischen Analyse." The earlier volumes are nearly all technical monographs dealing with the various phases of analytical chemistry. In the present volume, however, there has been gathered together an immense amount of general information for the organic chemist.

Everywhere that chemistry is taught there are given courses in inorganic qualitative analysis and text-books and reference works dealing with the separation and identification of inorganic compounds are to be found in every chemist's library. When, however, we pass into the realm of the carbon compounds we find that an entirely different situation obtains. There are but few texts or reference works dealing with the separation and identification of organic compounds, and it is a rare university that lists a course in qualitative organic analysis. This volume by Dr. Rosenthaler should, therefore, receive a hearty welcome from the organic chemist and will undoubtedly stimulate courses in the separation and identification of organic compounds.

In the introductory chapter are given the various qualitative tests for carbon, hydrogen, nitrogen, the halogens, sulfur, phosphorus, arsenic, etc., following which, in succeeding chapters are considered hydrocarbons, alcohols, aldehydes, ketones, carbohydrates, phenols, acids, oxy-acids, aldehyde- and keto-acids, ethers, quinones, esters, halogen derivatives, nitro derivatives, nitriles and iso-nitriles, acid amides, amines, aromatic hydrazines, azo and diazo compounds, acid derivatives of organic bases, heterocyclic bases, amino acids, polypeptides, organic sulphur compounds, organic arsenic compounds, alkaloids, resin acids, tannins, glucosides, saponines, pigments, proteins, enzymes and tox-albumens.

Rosenthaler's scheme of analysis is to first of all determine to which group or groups of compounds the unknown belongs. In order to do this the characteristic reactions of each class mentioned above are given very explicitly.